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WAVE LENGTHS AND ZEEMAN EFFECTS IN LANTHANUM SPECTRA

By William F. Meggers

ABSTRACT

The wave lengths corresponding to more than 1,500 lines photographed in the arc and spark spectra of lanthanum were measured relative to standards in the iron spectrum. The values extend from 2,142.81 A in the ultra-violet to 10,954.6 A in the infra-red. Data on the furnace spectra of 695 lanthanum lines studied by King and Carter in the interval 2,798 to 8,346 A are quoted. Measurements of Zeeman effects for 476 lines ranging in wave length from 2,791 to 7,483 A are also presented. Comparison of relative intensities and other characteristics of lines in the different sources permitted a sharp discrimination between three classes of lines; about 700 are ascribed to neutral atoms (constituting the La I spectrum), 800 originate with singly ionized atoms (La II spectrum), and 10 belong to doubly ionized atoms (La III spectrum). These data form a complete and accurate description of atomic lanthanum spectra, suitable for chemical indentification and for analysis of the spectral structures. A new infra-red sequence of La O bands is appended.

CONTENTS

	Page
I. Introduction	239
II. Experimental	240
1. Wave lengths	240
2. Zeeman effects	240
III. Results	242

I. INTRODUCTION

Lanthanum (La = 138.90; Z = 57) is the third element in the sixth period of the periodic classification, and is analogous to scandium and yttrium which appear in similar positions in the fourth and fifth periods. The emission spectra of scandium [1] and yttrium [2] have been described with satisfactory thoroughness and precision, but lanthanum data of the same quality have been lacking up to the present.

Attempts to analyze the structures of lanthanum spectra,[3] when based upon the published wave lengths and Zeeman effects, were only partially successful and it was evident that more extensive and accurate descriptive material was required before the structural analyses could be completed. Such data are now presented in this paper; they comprise wave-length measurements from 2,100 to 11,000 A, estimated relative intensities for 1,535 lines, and Zeeman effect observations for 476 lines in the interval 2,800 to 7,500 A.

[1] W. F. Meggers, B. S. Sci. Paper No. 549, vol. 22, p. 61, 1927.
[2] W. F. Meggers, B. S. Jour. Research, vol. 1 (RP12), p. 319, 1928.
[3] W. F. Meggers, La I, J. Wash. Acad. Sci., vol. 17, p. 25, 1927. W. F. Meggers, La II, J. Opt. Soc. Am., vol. 14, p. 191, 1927.

Analysis of the structures of lanthanum spectra and details concerning the hyperfine structure of lanthanum lines will be given in other papers.

The only remaining spectra of this type are those associated with actinium, the optical spectra of which have never been investigated.

II. EXPERIMENTAL

1. WAVE LENGTHS

The lanthanum salts used in this investigation consisted of $LaCl_2$ purified by Auer v. Welsbach, pure La_2O_3 kindly supplied by Prof. B. S. Hopkins of the University of Illinois, and commercial $LaCl_2$ purchased from Eimer and Amend. The latter material contained a considerable amount of cerium, and its use was confined mainly to the observation of Zeeman effects.

Arc spectrograms were made with electric arcs between electrodes of graphite, silver, or copper, a small portion of lanthanum salt being placed on the lower electrode before striking the arc. The arc was fed by 5 to 6 amperes direct current from a circuit with 220 volts potential difference. Some of the spark spectrograms were made with the same metal electrodes which had been used previously for arc spectra, the salt fused on the rods in the arc sufficed to give well-developed spark spectra. Additional spark spectrograms were obtained with graphite electrodes upon which a solution of $LaCl_2$ was allowed to drip during the exposure. For excitation of spark spectra a 40,000-volt transformer consuming about a kilowatt was used, with condensers of 0.006Hμf capacity in parallel with the spark in the secondary circuit. Comparison arc and spark spectra of graphite, silver, and copper were photographed adjacent to those of the electrodes plus lanthanum salt so that lines due to the electrodes or to atmospheric gases could be recognized and avoided during measurement. Finally, the arc spectrum of iron was recorded alongside each lanthanum spectrogram to supply the scale of standard wave lengths from which the values for lanthanum lines were derived.

The wave-length interval from 2,500 A in the ultra-violet to 11,000 A in the infra-red was investigated with concave gratings, while the shorter wave portion to 2,000 A was photographed with a quartz spectrograph. Since these spectrographs have already been described in connection with their use in the study of yttrium spectra [4] further details concerning them can be dispensed with here.

Most of the spectrograms were made on photographic plates of thin glass coated with Eastman 33 emulsion, the plates being sensitized with pinaverdol, pinacyanol, dicyanin, and neocyanin to photograph the longer wave portions. The longest wave length photographed in lanthanum spectra with neocyanin-stained plates was 9,737 A, but the infra-red limit was easily extended to 10,955 A during the past winter by employing Eastman "Q" type plates sensitized with xenocyanine.

2. ZEEMAN EFFECTS

Spectrograms for the study of lanthanum lines in a magnetic field were made with one of the stigmatic concave-grating spectographs

[4] W. F. Meggers, B.S. Jour. Research, vol. 1 (RP12), p. 320, 1928.

referred to above. The spectral range investigated extended from 2,500 A to 8,000 A, the first half of which was photographed in the second-order spectrum with a scale of 1.8 A per millimeter and the remainder in the first order. Photographic plates and procedure were the same as for wave-length measurements described above. The exposures ranged from 30 minutes in the violet to 5 hours in the red, the source being a spark between graphite electrodes upon which $LaCl_2$ solution was allowed to drip from a burette during the exposure.

The magnetic resolution was obtained with a water-cooled Weiss electromagnet operated with a speed-regulated motor-generator set supplying 150 amperes at 98 volts to the magnet windings. With a pole gap of 6 mm, the field strength was about 33,000 gausses. The actual field strength obtaining for each exposure was derived from the measured resolutions of standard lines. The following lines served as field standards:

Element	Wave length	Zeeman pattern
Ca	3, 933. 670	$\frac{(1)\ 3.5}{3}$
	3, 968. 475	$\frac{(2)\ 4}{3}$
Al	3, 944. 025	$\frac{(2)\ 4}{3}$
	3, 961. 537	$\frac{(1)\ 3, 5}{3}$
Zn	4, 680. 140	$\frac{(0)\ 4}{2}$
	4, 722. 163	$\frac{(1)\ 3, 4}{2}$
	4, 810. 534	$\frac{(0, 1)\ 2, 3. 4}{2}$
Na	5, 889. 965	$\frac{(1)\ 3, 5}{3}$
	5, 895. 932	$\frac{(2)\ 4}{3}$
K	7, 664. 94	$\frac{(1)\ 3, 5}{3}$
	7, 699. 01	$\frac{(2)\ 4}{3}$

The Ca, Na, and K lines arose naturally from impurities in the La Cl_2 solution, and to these a 2-minute exposure of Al or Zn was added at the end of the La exposure. Thus either four or five lines were always present to reveal the intensity of the magnetic field and the average probable error of such a determination was about one-fourth per cent.

In making the Zeeman-effect spectrograms light from the source was projected onto the slit of the spectrograph by means of a fused quartz lens after passing through a quartz Wollaston prism. A double image was thus obtained which gave a complete separation of light polarized parallel and perpendicular to the lines of force, thus permitting the two polarizations to be photographed simultaneously without overlap.

III. RESULTS

Limited portions of the arc and spark spectra of La have already been described by different observers. The early observations up to 1910 are quoted by Kayser[5]; the only ones worth mentioning here are measurements in arc spectra by Rowland and Harrison (3,104.702 to 5,930.330 A), and by Wolff (2,610.428 to 5,762.040 A).[6]

A list of arc lines (2,610.43 to 6,774.52 A) and another of spark lines (2,216.20 to 6,643.10 A) was published by Exner and Haschek.[7] The arc spectrum of La was investigated in the region of longer wave lengths (5,501.349 to 9,078.99 A) by Kiess,[8] and in the ultra-violet (2,200 to 3,100 A) by Piña de Rubies.[9]

The above-mentioned descriptions refer mainly to arc spectra, they contain little or no information as to which lines belong to ionized atoms, and they cover their respective intervals with different scales of wave lengths and of intensities.

Altogether, their inadequacy as standard descriptions of the successive spectra characteristic of La atoms justifies the preparation and publication of the following results, appearing in Table 1. No mention is made in any of the earlier descriptions of La spectra of hyperfine structure; it was first noted by King[10] and studied by Meggers and Burns.[11] It now appears that a considerable number of the La lines are complex. (Indicated in Table 1 by the letter "c" following the wave length.) Since hyperfine structure of La lines has no particular importance in a general description, and is furthermore the subject of a special investigation, no further discussion of it will be made here; the results in Table 1, either for wave-length values or for Zeeman effects, apply to the center of gravity of a line whether it is narrow or appears widened due to partial resolution of the hyperfine components.

The probable errors of wave-length measurements reported in Table 1 are usually less than 0.01 A for the stronger lines between 3,100 and 6,000, but the errors for the remaining lines are somewhat larger since they were measured for the most part with smaller dispersion. Many lines appearing enhanced or only on the spark spectrograms are hazy and unsymmetrical; such lines are not susceptible of precise measurement and may be in error by several hundredths of an angstrom unit.

Any attempt to describe the atomic spectra of La must contend with the nuisance of bands due to molecular compounds. In an investigation of the band spectra of LaO, Meggers and Wheeler[12] measured more than 300 band heads in the ordinary arc spectrum and classified the bands in possibly nine systems. The bands appear with considerable intensity throughout almost the entire range from 4,300 to 9,800 A, causing difficulty and uncertainty in the detection

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[5] H. Kayser, Handbuch der Spectroscopie, vol. 5, p. 655, S. Hirzel, Leipzig, 1910.
[6] A. Rowland and C. N. Harrison, Astrophys. J., vol. 7, p. 373, 1898; E. Wolff, Zeitschr. f. wis. Phot., vol. 3, p. 395, 1905.
[7] F. Exner and E. Haschek, Die Spektren der Elemente bei Normalem Druck, vol. 2, p. 114, 1911; vol. 3, p. 105; 1912. F. Deuticke, Wien.
[8] C. C. Kiess, B. S. Sci. Paper No. 421, vol. 17, p. 318, 1921.
[9] S. Piña de Rubies, Anales Soc. Esp. Fis. Quim., vol. 23, p. 444, 1925.
[10] A. S. King and E. Carter, Astrophys. J., vol. 65, p. 86, 1927.
[11] W. F. Meggers and K. Burns, J. Opt. Soc. Am., vol. 14, p. 449, 1927.
[12] W. F. Meggers and J. A. Wheeler, B. S. Jour. Research, vol. 6 (RP273), p. 239, 1931.

of the weaker atomic lines. Since the data for LaO band heads (3,565 to 9,150 A) have already been published, they will be omitted here, and no reference to bands will be found in Table 1 except when coincident or unresolved from lines belonging to the atomic spectra. Observations of the arc spectrum of La in the infra-red with xenocyanine plates revealed another long sequence of band heads extending from 9,111 to 9,729 A. These constitute the 0–2 sequence of System VII, and are presented here as Table 2.

The only published Zeeman effects of lanthanum lines are those observed by Rybar[13] in 1911; they extend over the range 2,791 A to 5,188 A and include about 215 lines. These observations are fairly satisfactory, and it was at first my intention only to supplement them with data for the longer waves. However, a trial exposure in the ultra-violet indicated that Rybar's results might be improved and extended by reobservation, and the desirability of having the magnetic resolutions of La lines strictly comparable over a wide range of spectrum finally persuaded me to extend measurements to the same ultra-violet limit. In column 5 of Table 1, the observed Zeeman effects are given for 460 La lines ranging in wave length from 2,798 A to 7,483 A. A few lines observed by Rybar, but not measurable on my spectrograms, are quoted and followed by the letter R. The patterns are presented in the standard notation for Zeeman effects; that is, the separations are expressed in decimal parts of a, the separation of a normal triplet, components polarized parallel to the magnetic field being inclosed in parentheses followed by the perpendicular components. In resolved complex patterns the strongest components are printed in bold-face type. For unresolved patterns a conscious effort was made to measure the strongest components when the type could be easily recognized and a symbol added to indicate the intensity distribution among the fused components. For this purpose, the notation used by Back[14] for distinguishing various types of intensity gradients was employed. The letters A or B after a Zeeman effect mean that the pattern is complex but unresolved, and A indicates that the maximum intensity for perpendicular components is at the edge of a group, while B signifies that it is in the middle. The distinction between strongest component inside or outside of the group is shown by A^1 and A^2, respectively. The interpretation of these Zeeman effects will be given in another paper dealing with the spectral series classification of La lines.

An important contribution to the description of the atomic spectra of La is found in the temperature classification of La lines by King and Carter.[15] From an examination of the furnace, arc, and spark spectra in the interval 2,800 A to 8,400 A data were obtained for a classification of 695 La lines according to the temperature required for initial appearance and the rate of change of line intensity as the temperature is increased. These lines were divided into five classes. Lines in Classes I and II appear at low temperature (2,000° C.), but those of Class I show a slower change from low to high temperature

[13] S. Rybar, Math. es Phys. Lapok, vols. 20–21, p. 198, 1911–12; Phys. Zeitschr. vol. 12, p. 889, 1911, a partial list.
[14] E. Back, Zeitschr. f. Phys., vol. 15, p. 212, 1923.
[15] A. S. King and E. Carter, Astrophys. J. 65, p. 86; 1927.

than those of Class II, and as a rule are less conspicuous in the arc. Lines of Class III are usually well developed at medium temperature (2,200° to 2,300° C.), while lines clearly associated with high temperatures (2,600° to 2,800° C.) are placed in Classes IV and V, those of Class V being absent or very faint in the furnace spectrum. A large number (230) of the lines thus classified are enhanced in the spark and more than half of these appear in the furnace. This indicates that La atoms are ionized with relative ease, which accounts for the great prominence of spark lines in the ordinary arc. In fact, a majority of the La atoms appear to be ionized in the 220-volt arc, and there can be no doubt that the best method of developing the spectrum of neutral atoms is by means of a temperature-controlled vacuum furnace which restricts ionization and also eliminates confusion with molecular spectra. A few lines not detected on my spectrograms were measured on furnace spectrograms by Professor Russell; they are marked H. N. R. in Table 1.

In the last column of Table 1 an attempt is made to assign each observed wave length to its proper atomic origin. This separation of lines into La I, La II, La III spectra is based primarily upon the relative intensities and other characteristics appearing in column 2. It is supported by the temperature classification and further description in column 3 and by Zeeman effects (column 5) describing combinations of spectral terms having even multiplicity for La I and La III lines, but odd multiplicity for La II lines. In the infra-red where data on spark intensities, temperature classes, and Zeeman effects are lacking, the lines are assumed to belong to the La I spectrum unless they are accounted for as combinations of the La II spectral terms. The significance of the symbols and abbreviations used in Table 1 is summarized as follows:

h=hazy (n for King and Carter).
l=shaded to long wave lengths.
M=molecular spectrum, La O band head.
p=part of band structure.
d=double.
c=complex.
E=enhanced line.
A=stronger in furnace than in arc.
A^1=strongest *s*-components of Zeeman effect inside.
A^2=strongest *s*-components of Zeeman effect outside.
B=strongest *s*-components of Zeeman effect in center.
w=wide.
W=very wide.
us=unsymmetrical.
ur=unresolved.
R=Zeeman effect by Rybar.
H. N. R.=wave length by Henry Norris Russell.
e=appearing only at negative electrode.

TABLE 1.—*Wave lengths and Zeeman effects in lanthanum spectra*

λ (air) I. A.	Intensity arc spark B. S.	Arc intensity and temperature class K and C	ν (vac.) cm⁻¹	Zeeman effect	Spectrum
10, 954. 6	3		9, 126. 09		II
10, 952. 0	1		9, 128. 25		I
10, 739. 66	5		9, 308. 73		I
10, 612. 56	10		9, 420. 21		I
10, 552. 41	6		9, 473. 91		I
10, 522. 09	10		9, 501. 21		I
10, 483. 0	2		36. 6		I
61. 69	15		56. 07		I
50. 82	20		66. 01		I
23. 4	1		9, 591. 2		I
10, 409. 55	3		9, 603. 93		I
10, 372. 4	1		38. 4		I
57. 70	20		52. 01		I
49. 08	40		60. 05		I
37. 20	3		71. 15		I
32. 40	2		75. 64		I
30. 3	1		77. 6		I
10, 318. 2	2		9, 689. 0		I
10, 294. 68	10d		9, 711. 09		I
85. 64	3		21. 52		I
81. 34	10		23. 69		I
78. 52	3		26. 37		I
74. 85	10		29. 84		I
34. 78	2		67. 93		I
23. 76	1		78. 46		I
19. 83	3		82. 22		I
10, 209. 85	2		9, 791. 78		I
10, 186. 5	2		9, 814. 2		II
84. 60	20		16. 06		I
77. 74	6h		22. 67		I
54. 74	40		44. 92		I
43. 38	2		55. 95		I
41. 20	10		58. 06		I
30. 82	5		68. 17		I
10, 111. 9	2h		9, 886. 6		I
10, 093. 54	1		9, 904. 62		II
83. 96	2		14. 03		I
66. 77	6		30. 95		I
58. 79	2		34. 84		I
54. 82	2		42. 76		I
29. 74	2		67. 62		I
14. 45	4		82. 84		I
10, 005. 73	50		9, 991. 54		I
9, 988. 47	10		10, 008. 80		I
81. 24	6		016. 05		I
80. 38	10		016. 91		I
65. 70	3		031. 67		I
32. 72	2		064. 98		I
20. 82	150		077. 06		I
9, 911. 08	3		086. 95		I
9, 893. 82	4		104. 55		II
81. 24	100		117. 42		I
62. 60	3		136. 54		I
52. 58	6		146. 85		I
48. 70	4		150. 84		I
42. 0	2		157. 8		I
33. 30	3*h*		166. 74		I
05. 2	1*h*		195. 9		I
9, 804. 20	2		196. 92		I
9, 775. 09	8		227. 28		I
72. 24	20		230. 26		I
68. 82	3*h*		233. 85		I
37. 09	100		267. 20		I
13. 52	3		292. 11		I
9, 709. 45	10		10, 296. 42		

TABLE 1.—*Wave lengths and Zeeman effects in lanthanum spectra*—Continued

λ (air) I. A.	Intensity arc	Intensity spark B. S.	Arc intensity and temperature class K and C	ν (vac.) cm⁻¹	Zeeman effect	Spectrum
9,706.48	20			10,299.57		I
9,699.64	20			306.84		I
96.7	1			310.0		I
92.6	2			314.3		I
72.94	3			335.29		II
72.04	8			336.25		I
57.00	20			352.35		II
46.47	3			363.65		I
40.81	30			369.73		I
33.72	40			377.36		I
9,631.84	2			379.38		I
9,570.38	5			446.04		I
63.60	4			453.45		II
60.69	10			456.63		I
42.06	50			477.05		I
41.23	20			477.96		I
9,528.0	1*h*			492.5		I
9,485.15	15			539.91		I
84.2	1			541.0		I
76.98	3			548.99		I
74.45	5			551.81		I
67.25	2			559.84		I
61.82	60			565.89		I
57.62	2			570.59		I
41.7	1			588.4		I
38.30	100			592.23		I
15.64	3			617.71		I
9,412.65	100			621.08		I
9,398.2	1			637.4		I
90.56	4			646.07		I
77.71	3			660.66		I
76.10	3			662.49		I
72.57	30			661.51		I
46.69	15			696.04		II
28.87	2			716.47		I
24.5	1			721.5		I
9,312.9	1h			724.5		I
9,293.3	2h			757.5		I
87.5	1h			764.2		I
60.42	3			795.69		II
54.70	10			802.36		I
50.06	20			807.78		I
26.63	30			835.22		I
9,219.64	10			843.44		I
9,172.88	5			898.71		I
72.39	10			899.30		I
57.13	10			917.46		I
51.62	6			924.03		I
46.75	2			929.85		II
43.78	5			933.40		I
42.24	6			935.24		I
27.5	1			952.9		II
19.18	20			962.89		I
09.25	2			974.84		I
9,101.10	2			984.67		II
9,096.71	3			10,989.97		II
79.10	50			11,011.29		I
58.63	2			036.17		I
56.53	5			038.73		I
46.97	2			050.39		I
25.05	4			077.23		I
16.80	2			087.37		II
9,008.26	6			097.88		I
8,977.39	2			136.04		I
8,970.07	3			11,145.13		I

TABLE 1.—*Wave lengths and Zeeman effects in lanthanum spectra*—Continued

λ (air) I. A.	Intensity arc spark B. S.	Arc intensity and temperature class K and C	ν (vac.) cm⁻¹	Zeeman effect	Spectrum
8,965.41	2		11,150.92		I
63.63	10		153.13		I
57.74	50		160.47		I
48.89	2		171.50		I
47.95	1		172.68		I
8,917.70	1h		210.58		I
8,891.06	1		244.17		I
84.24	2		252.80		I
79.56	3		258.73		I
75.05	2		264.45		I
71.00	4		269.60		I
67.35	3		274.24		I
39.64	20		309.57		I
25.86	50		327.23		I
21.66	1h		332.62		I
18.96	20		336.10		I
8,810.57	3		346.89		II
8,797.6	2h		363.6		I
81.98	2		383.83		II
72.02	1		396.76		I
67.92	4		402.07		I
60.4	1		411.9		I
48.42	50		427.50		I
24.12	1		459.33		I
20.42	20		464.19		I
8,703.13	5		486.97		I
8,674.40	60		525.01		I
72.10	30		528.07		I
50.82	2		556.43		II
24.22	6		592.07		I
8,621.55	2		595.66		I
8,590.97	6		636.94		I
58.9	1		680.5		I
45.44	50		698.94		I
43.46	20		701.65		I
29.68	3		720.55		I
14.65	3		741.24		II
13.55	15		742.76		I
8,507.37	10		751.29		I
8,484.01	2		783.65		II
76.48	30		794.12		I
67.62	15		806.45		I
8,440.06	3		845.01		I
8,379.80	20		930.18		I
58.50	2h		960.59		I
46.60	100	12 III	977.64		I
34.44	3		11,995.11		I
24.72	100	15 III	12,009.12		I
24.59	H. N. R.	1 III A	009.30		I
23.35	1		011.10		II
16.05	10	2 IV A	021.64		I
8,302.82	4		040.80		I
8,247.46	60	10 III	121.62		I
37.90	3		135.68		I
11.65	2		174.48		I
8,203.38	3		186.75		I
8,159.05	10 M(?)		252.96		II(?)
8,086.10	20+M4	15 III	363.50		I
84.53	3		365.92		I
59.5	3h 3h		404.3		II
51.38c	10 2	10 III	416.82		I
8,001.91	4 1	4 III A	493.58		I
7,964.86	5 2	6 III	551.70		I
48.30	H. N. R.	10 III	577.85		I+*M*
7,931.18	1 —		12,605.00		I

TABLE 1.—*Wave lengths and Zeeman effects in lanthanum spectra*—Continued

λ (air) I. A.	Intensity arc	Intensity spark B. S.	Arc intensity and temperature class K and C	ν (vac.) cm⁻¹	Zeeman effect	Spectrum
7,927.83	1	2		12,610.33		II
7,891.69	1	2		668.08		II
79.93	2	4		686.98		II
64.98	1	—		711.10		I
41.76	3	1	2 III A	748.74		I
7,838.83	1	1		753.50		II
7,740.54	(?)	2h		915.45		II+M
7,737.74	1h	(?)		12,920.12		I+M
7,664.38	4	2	? III	13,043.78		I
7,612.94	3	3		131.92		II
7,539.24	10	3	15 II	260.29		I+M
33.64	2	(?)		270.14		I
7,501.78	1	(?)		326.50		I
7,498.82	2	2	5 III A	331.76		I
89.15	(?)	1		348.98		II
83.48c	15	30	20 IV E	359.10	(0.00) 1.12	II
7,463.08c	5	2	10 III	395.61		I
7,382.73	6	2	5 III A	541.40		I
79.71			10 III A	546.94		I+M
45.36c	25	7	20 III A	610.30	(0.42) 1.18	I
44.42	H. N. R.		2 III A	612.03		I
40.08	—	2		620.08		II
34.18c	50	10	60 II	631.04	(0.00 w) 1.30 w	I
20.90	2	1		655.77		I
7,308.46	2h	(?)		679.01		I+M
7,297.99	—	2		698.63		II
85.83	1	(?)		721.50		I
82.36	100	150	100 III E	728.03	(0.00 w) 1.26	II
70.30	H. N. R.		5 II A	750.81		I
70.07	H. N. R.		10 III	751.24		I
66.13	2	5		758.70		II
63.68	2	(?)		763.34		I
62.83	2	(?)		764.95		I
50.38	1	—		788.59		I
19.92	15	2	15 II A	846.76		I
17.16	2	(?)		852.06		I
7,213.95	1	2		858.22		II
7,161.25	40	10	50 III	960.20	(0.00) 0.91	I
58.11c	30	10	50 II A	966.32	(0.00) 1.27	I
51.92	H. N. R.		1 III A	978.42		I
49.76	2	1	2 III	13,982.63		I
18.6	(?)	2		14,043.8		II
16.8	(?)	3		047.4		II
7,104.7	(?)	3h		071.3		II
7,098.18	2	(?)		084.24		I
92.40	H. N. R		2 I A	095.72		I
79.74	—	4		120.92		II
76.36	3	2	3 III	127.67		I
68.37	60	10	100 II	143.64	(0.69) (?)	I
66.24c	200	300	400 III E	147.90	(0.00) 0.70	II
62.4	1h	(?)		155.6		I
45.96c	200	30	300 II	188.62	(**0.21**, 0.65) 1.04, **1.47**	I
32.07	25	5	15 III	216.65	(0.60) 1.27	I
23.67c	150	20	150 III	233.66	(0.00) 1.16	I+M
7,013.15	2	1		255.00		I
6,978.09	2	1		326.62		I
76.87	2	1	3 III	329.13		I
68.78	2	25	tr V E	345.76	(0.00) 0.81	II
58.11	30	100	20 IV E	367.76	(0.21) 0.96	II
54.54c	20	20	8 IV	375.14		II
52.52c	10	10	2 IV	379.31	(0.00) 1.10	II
35.03	50	8	50 III	415.58	(0.48) 1.14	I
25.27	80	15	100 III	435.90	(0.00w) 1.58 A[2]	I
18.33	8	2	8 III A	450.38		I
6,917.26	10	3	10 III A	14,452.61		I

TABLE 1.—*Wave lengths and Zeeman effects in lanthanum spectra*—Continued

λ (air) I. A.	Intensity arc	Intensity spark B. S.	Arc intensity and temperature class K and C	ν (vac.) cm^{-1}	Zeeman effect	Spectrum
6,903.08	2	1	1 III A	14,482.30		I
6,902.08	3	3	1 III	484.40		I(?) II
6,899.63	2h	1	tr V	489.54		
98.41			tr V	492.10		I
59.03	4	5	tr V	575.31		II
37.91	15	15	3 IV(?) E	620.32		II
34.07	20	20	4 IV(?) E	628.54	(1.05) (?)	II
30.83	1	6	tr V E	635.48	(0.00) 0.98	II
23.80	40	10	15 II A	650.56	(0.00) 1.15	I
21.51	5d	2	3n V	655.47		I
19.14	1	—		660.57		I
16.29			1n V(?)	666.70		
13.63	5	50	1 V(?) E	672.32	(1.04) 1.29 B	II
03.88c	30	30	6 IV	682.66	(0.00h) 1.56h	II
6,801.38	1	5		698.85	(0.00) 1.10	II
6,796.73	4	1	4 II A	708.90		I
83.55	1	—	tr IV A	737.48		I
78.19	1	—	tr V	749.14		I
76.69	1	—	1 III A	752.40		I
74.28c	80	100	30 III E	757.65	(6.00w) 1.10	II
60.73	H. N. R.		1 III A	787.23		I
60.23	1	1		788.32		I
53.05	40	10	50 I A	804.04	(0.00W) 1.51 A^2	I
50.47	1	1		809.70		II
48.12c	10	3	10 II A	814.86		I
41.20	2	1		830.07		I
37.29	1	—		838.67		I
32.80c	2	40	1 V E	848.57	(0.00) 0.99	II
18.68	2	60	tr V E	879.78	(0.69) 1.12 B	II
15.96	1	—	1 IV A(?)	885.80		I
14.08	5	80	2 V E	889.97	(0.00) 1.38	II
6,709.49	150	30	200 I	900.16	(0.00) 1.18	I
6,699.86	3	1	4 III A	921.57		I
99.26	2	2	2 III(?)	922.91		I
92.86c	20	4	30 I A	937.18	(0.00) 1.06	I
76.14	1	3		974.59		II
71.41c	15	40	6 IV(?) E	14,985.20	(0.63) 1.17	II
64.45	1	—		15,000.85		I
61.40c	60	15	80 I A	007.72	(0.65) 1.23 B(?)	I
58.06	1	—		015.25		I
50.81c	80	20	100 I A	031.62	(0.00w) 0.88	I
45.15	7	3	8 IV	044.42		I
44.40c	30	5	40 I A	046.12		I
42.79	10	100	3 V E	049.77	(0.33) 0.82	II
36.53	3	5	1 V	063.96		II
31.20	3	3	3 V(?)	076.07		I(?)
28.4	1	1	1 IV A	082.4		I
19.10	—	2		103.63		II
16.59c	60	10	80 I	109.36	(0.59) 1.12 B	I
12.48	3	1		118.75		I
08.25c	40	5	40 II	128.43	(0.00) 1.01	I
07.7	1	—	3 IV	129.7		I+M
6,600.17c	25	5	50 II A	146.95	(0.35) 1.12	I
6,599.48			tr IV A	148.53		
93.45c	40	5	60 I	162.39	(0.00w) 1.30 A^2	I
90.59	1	—		168.97		I
82.18	4	2	6 IV	188.35	(0.00h) 1.41	I
78.51c	200	100	400 I	196.82	(0.00) 1.00	I
70.96	2	(?)	2n III	214.28		II
68.54	1	(?)		219.89		I
65.45	40	(?)	40 I A	227.05		I
55.95			3 III A	249.12		I
55.11	2	(?)	1 V	251.07		1
54.18	2	(?)	1 V	253.23		II
6,551.78	1	(?)		15,258.82		I

TABLE 1.—*Wave lengths and Zeeman effects in lanthanum spectra*—Continued

λ (air) I. A.	Intensity arc	Intensity spark B. S.	Arc intensity and temperature class K and C	ν (vac.) cm⁻¹	Zeeman effect	Spectrum
6,549.16	2	(?)	2n III(?)	15,264.92		I
43.17c	300	100	500 I	278.90	(**0.33**, 0.99) 0.00, 0.74, 1.41, **2.07**	I
29.72c	4	4h	4 III(?)	310.37		II
26.99c	100	200	100 III E	316.77	(**0.00**, 0.22) 0.94 A²	II
23.86	2	1	2 III A(?)	324.12		
						I
20.70	·15	3	20 IV	331.55	(0.00h) 1.10h	I
19.30	3	1	4 IV	334.84		I
17.35	1	—		339.43		I
6,506.25	4	2	6 IV	365.59		I
6,498.19	30	250	7 IV(?) E	384.66	(0.00) 0.81	II
92.86	4	2	5 V	397.29		I
85.54c	20	5	20 II A	414.66	(0.00) 1.10	I
80.20	1	—		427.37		I
68.44c	10	3	8 II A	455.42		I
55.99	250	100	300 I	485.22	(0.00) 1.18	I
54.50c	150	50	200 I	488.80	(**0.38**, 1.11) 0.80, 1.54, **2.26**	I
50.34	6	3	8 II A	498.78	(0.00) 1.29	I
49.94	3	—		499.74		I
48.25	4	2	10(?) II A	503.81		I
48.10	20	10	50(?) II A	504.17		I
46.62	15	200	5 V E	507.73	(0.00w) 1.43 A²	II
43.05	3	50h	1 V	516.32	(0.00w) 0.76 A¹	II
26.60	2	1		556.04		I
20.90	1	—		569.85		I+M
17.23	2	1	3 III(?) A	578.75		I+M
15.39	1	1		583.22		II
6,410.98	200	60	300 I	593.94	(0.00) 1.09	I
6,399.04	20	400	10 V(?) E	623.04	(0.00) 1.04	II
94.23c	400	100	600 I	634.79	(0.00 w) 1.02 A¹	I
90.48	100	200	80 III	643.96	(0.00) 1.03	II
80.48	1	1	1 V	664.48		I
75.50	2	—		780.72		I
75.11	2	—	2 V	681.68		I
74.08	3	30	1 V	684.21	(0.00 W) 1.67 A²	II
60.20c	30	10	30 II	718.44	(0.00) 0.89	I
58.12	20	30	5 IV	723.58	(0.99) 0.49, 1.52	II
56.38	3	1	4 III A	727.88		I
53.63	1	—		734.69		I
39.16	2	1	2 III A	770.61		I
37.88	2	3	1 V	773.79		II
33.74	3	2	2 IV(?)	784.10		I
33.24	2	1	2 III(?)	785.35		I+*M*
30.42	3	1	2 III A	792.38		I
25.90	100	20	150 I	803.67	(0.63, **0.99**) 0.25, 0.63, **1.01**, 1.38, 1.76	I
20.39c	100	200	80 III	817.44	(0.44) 0.87 B	II
18.26	5	2	12 III A	822.78		I
15.79	3	50	1 V	828.96	(0.95) 0.49, 1.43	II
10.91	8	200	4 V E	841.20	(0.27) 1.10 B	II
10.13	8	5	12 IV	843.16		I
08.87	2	?	2 III	846.32		I
08.21	2	?	3 III	847.98		I
07.25	1	20h	tr IV	850.40	(0.00) 0.51	II
6,305.46	10	10	5 IV	854.90		II
6,296.08c	100	300	50 IV E	878.52	(0.00 W) 1.20 A²	II
93.57c	60	10	80 II A	884.85	(0.00) 1.33	I
88.56	6	3	7 III A	897.50		I
87.73	7	3	8 III A	899.60		I
78.31	1	1		923.46		I
73.76	4	100	2*n* III(?)	935.01	(0.00) 1.04	II
66.00c	40	20	60 III	954.74	(0.00) 1.06	I
62.30	100	300	{30(?) 50(?)} III	964.17	(0.00 w) 1.10 A¹	II
49.92c	300	100	500 I	15,995.79	(0.00) 1.13	I
38.58	12	3	15 III A	16,024.86		I
36.76c	7	2	10 III A	029.54		I
6,236.17	8	3	12 IV	16,031.06		I

TABLE 1.—*Wave lengths and Zeeman effects in lanthanum spectra*—Continued

λ (air) I. A.	Intensity arc	Intensity spark B. S.	Arc intensity and temperature class K and C	ν (vac.) cm^{-1}	Zeeman effect	Spectrum
6, 234. 85c	10	3	15 III A	16, 034. 45	(0.00) 1.26	I
33. 51	10	3	15 III A	037. 90		I
32. 56	1	1		040. 34		I
25. 33	2h	1		058. 97		I
24. 24	1	1		061. 78		I
19. 46	2	1	2 V	074. 13		I
18. 19	5	2	7 III	077. 41		I
14. 35	2	1		087. 34		I+M
06. 76	2	1		107. 02		I
6, 203. 51	3	50l	2 V	115. 46	(0.17) 1.14h	II
6188. 09	5	100l	1 V	155. 61	(0.00 W) 1.02 A^1	II
74. 15	4	6	1 V	192. 09	(0.00) 0.63	II
73. 74			1 IV A	193. 17		I
72. 72	10	10	5 V	195. 84	(**0.00**, 0.32, 0.63) 1.69 A^2	II
67. 69	2	1		209. 05		I
65. 69c	30	10	40 II	214. 31	(0.88) 0.87, **1.43**, 1.99	I
65. 02	3	1	2 IV	216. 07		I
54. 55	1	—		243. 66		I
46. 53	10	15	5 IV	264. 85	(0.00 W) 1.69 A^2	II
45. 29	3	2	3 III	268. 13		I
42. 98c	10	5	10 III	274. 25	(0.00) 1.15	I
41. 71	3	—		277. 61		I
36. 48	2	1	2 II A	291. 49		I
34. 39c	20	8	30 III	297. 34	(1.34) 1.37	I
31. 92	1	1		303. 60		II
29. 57c	30	50	15 IV(?)	309. 85	(0.00 W) 0.99 A^1	II
27. 04	8	5	12 III A	316. 59		I
26. 09	20	50	10 V(?)	319. 12	(0.34) 0.92 B	II
23. 75	2	1	2 IV	325. 36		I
21. 27			1 IV	331. 97		I
20. 34			1 IV	334. 45		I II
11. 71c	20	7	30 II	357. 52	(0.00) 1.17	I
08. 47c	40	10	60 II	366. 19	(0.53) 1.34 B	I
07. 26	4	2	12 II A	369. 43		I
6, 100. 37	10	30	10 V	387. 92	(**0.00**, 0.34) **0.84**, 1.16	II
6, 092. 22	2	1	1 III A	409. 85		I
88. 00	2	1	1n IV	421. 22		I+M
85. 43	2	10	1n V	428. 15	(**0.00**, 0.74) 1.20, **1.90**	II
84. 86	5	3	8 III	429. 69		I
75. 24			1 III A	455. 71		I
74. 01	3	5	1 III A	459. 04	(0.21) 1.12	I II
72. 04	3	2	4 III A	464. 38		I
68. 70c	20	6	30 III	473. 44	(0.75) **0.40**, 1.90	I
67. 13	2	6	1 V(?)	477. 71	(0.00) 1.49	II
61. 42	2	2	2 V(?)	493. 23		II(?)
46. 07	2p(?)	2	1 IV(?)	535. 10		II(?)
44. 8	2	2	2 III A	538. 6		I
41. 6	2	2	2 III	547. 3		I
38. 57c	20	5	25 III A	555. 64		I
37. 98	1	2		557. 25		II
35. 12			2 V	565. 11		
34. 5	2h	2	3 V	566. 8		I+M
32. 38	5	2		572. 63		I
31. 46	5	2	3n IV(?)	575. 15		I+M
25. 09	2p(?)	1	1 IV(?)	592. 68		I
17. 16	3	2	1 III A	614. 54		I
6, 007. 34c	50	10	50 III A	641. 70	(0.00 W) 1.77 A^2	I
5, 992. 35c	3	2	2 III A	683. 33		I
91. 98	1	4h		684. 36		II
82. 34	10	4	5 III A	711. 25		I
75. 75c	10	6	3 III A	729. 68		I+M
73. 52c	15	120l	5 V E	735. 92	(0.00) 1.20	II
71. 09	3	8		742. 73	(0.00) 1.18	II
70. 58	H. N. R.		1 III A	744. 16		I
5, 965. 30	3	2	1 III	16, 758. 98		I

TABLE 1.—*Wave lengths and Zeeman effects in lanthanum spectra*—Continued

λ (air) I. A.	Intensity arc	Intensity spark B. S.	Arc intensity and temperature class K and C	ν (vac.) cm⁻¹	Zeeman effect	Spectrum
5,962.59	4	2	1 III A	16,766.60		I
61.43	2	3		769.86		II
60.59	4	3	3 III A	772.23		I
57.90	—	4		779.80		II
48.30c	10	20		806.9	(0.52) 0.86 h	II+M
40.83c	3	1	1 III A	828.01		I
36.22c	15	20	12 V E	841.08	(0.00) 1.21	II
35.29c	20	5	15 II A	843.72	(0.00 W) 1.72 A²	I
30.68	100	20	} 400 I	856.81		I
30.61	200	40		857.01	(0.00) 0.87	I
28.48	5	4	4 III A	863.07		I
27.71	5	30		865.26	(0.00) 1.30	II
18.26	—	4		892.19		II
17.64c	20	6	15 II A	893.96	(0.27) 1.10 h	I
04.28	4	3	2 III A	932.20	(0.00) 1.25	I
01.95	5	401	2 IV E	938.87	(0.00 W) 1.60 A²	II
5,900.75c	3	2	1 III A	942.31		I
5,894.84c	20	10	8 III A	959.30		I
92.66	3	4	1 V	965.58	(0.00) 1.54	II
85.23	—	1		16,986.99		II
80.63c	40	50	30 III E(?)	17,000.28	(**0.00**, 0.42) 0.54, 0.96, **1.38**	II
77.96	3	2	1 III A	008.00		I
77.62	4	2	2 III A	008.98		I
74.72c	8	4	8 III A	017.38		I
74.00	5	6	3 IV	019.47	(0.00) 1.49	II
69.93	2	2	1 III A	031.27		I
63.70	30	80	20 V E	049.36	(0.00) 0.96	II
57.44	2	—		067.58		I
55.57c	20	8	15 II A	073.03	(0.00 W) 1.42 A²	I
52.26c	6	4	2 III A	082.69		I
48.95	3	20		092.36	(0.00) 0.54	II
48.37c	15	5	8 III A	094.05	(0.00) 0.90	I
45.02c	10	5	6 II A	103.85	(0.00) 1.18	I
39.77	3	2	2 II A	119.23		I
29.71c	20	10	10 III A	148.77	(0.00) 1.75	I
28.44	2	2		152.51		II
27.56c	8	3	3 III A	155.10	(0.59) 1.50(?)	I
23.82c	15	10	10 III A	166.11	(0.00 w) 0.96 h	I
21.98c	30	20	30 III	171.54	(0.00) 0.93	I
13.44	2	1	1 III A	196.76		I
08.63	4	8		211.00		II
08.31	40	60	15 IV(?)	211.95	(0.00) 0.75	II
06.56	3	8		217.14		II
05.77	80	120	50 III E	219.48	(0.00) 1.09	II
5,802.10c	2	1	1 III A	230.37		I
5,797.57	100	150	50 III E	243.84	(0.00) 1.24	II
91.32c	200	60	400 I	262.45	(0.00 W) 1.31 B	I
89.22c	150	40	250 I	268.71	(0.15) 1.21	I
81.02	2	3		293.20		II
79.91	2	4		296.52	(0.00) 1,38 h	II
69.97c	25	20	25 III A	326.32		I
69.32	80	30	80 I	328.27	(0.00) 1.01	I
69.06c	40	60	50 VE	329.05	(0.00) 1.09	II
61.83c	50	20	60 I	350.80	(0.94) **0.00**, 0.68, 1.34	I
49.59	—	2		387.73		II
44.41c	60	20	80 III	403.41	(0.00 w) 1.24	I
42.93c	4	3	2 IIIA	407.90		I
40.65c	80	20	100 I	414.81	(0.47) 0.59 B	I
34.93c	6	4	5 IIIA	432.18	(0.00) 0.92	I
27.29	5	20	4 VE	455.43	(0.00) 1.45	II
20.01c	10	4	10 IIIA	477.65	(**0.16**, 0.48, 0.81) 1.93A²	I
14.55c			1 IIIA	494.35		I
14.01	4	3	5 IIIA	496.00	(0.62) (?)	I
12.39c	20	20	20 IIIE(?)	500.96	(0.00) 0.98	II
10.85	2p(?)	(?)	2 III	505.68		I
5,703.32	20	20	10 III	17,528.80	(0.00) 1.48	I II

TABLE 1.—*Wave lengths and Zeeman effects in lanthanum spectra*—Continued

λ (air) I. A.	Intensity arc	Intensity spark B. S.	Arc intensity and temperature class K and C	ν (vac.) cm⁻¹	Zeeman effect	Spectrum
5,702.57			2 III	17,531.10		I
01.15			1 III	535.47		I
5,700.25			3 III	538.24		Cu. (?)
5,699.32	3	2	5 III	541.10		I
96.18	30	15	40 I	550.77	(0.00w) 0.80A¹	I
71.54	10	100	8 VE	627.02	(0.00) 0.79	II
69.97			1 IV	631.90		Ce (?)
61.34c	2	2	1 IIIA	658.78		I
57.71c	30	15	50 II	670.10	(**0.29**, 0.88) 0.73, 1.33, **1.94**	I
56.54	2	2	1 IIIA	673.76		I
54.8c	20	10	3 IIIA	679.2		I+*M*
52.3	5	10h		687.0		II+M
48.24c	50	30	80 III	699.73	(00.0) 1.12	I
39.31c	8	5	5 IIIA	727.76		I
32.02	15	6	25 II	750.70	(0.00) 0.93	I
31.22	60	10	100 I	753.22	(0.00W) 1.45 A²	I
5,610.53	2	20		818.69		II
5,598.52	3	—		856.92	(0.00) 0.49	I
91.51	1	1		879.30		II
88.33c	100	20	80 II	889.48		I
70.37	3	2	5 IIA	947.16		I
68.45c	30	10	50 II	953.35	(0.44) 1.16	I
66.92	5	40	2 VE	958.28	(0.37) 1.24	II
65.70	10	5	20 II	962.22		I
65.43c	10	5	20 III	963.09	(0.00) 1.52	I
62.54	2	1	2 III(?)	17,972.42		I
47.56	2p(?)	3h		18,020.95	(0.00) 1.13	II
44.90	3	2	6 III	029.60	(0.28) 1.47	I
41.25c	15	10	20 III	041.47	(0.00) 1.25	I
35.66c	20	80	15 VE	059.69	(0.00W) 0.80 A¹	II
32.17	4	10	3 III	071.08	(0.00W) 0.61h	I II
29.86	2	2	3 III	078.63		I
26.51			2 V	089.59		I
24.40			1 V	096.50		
17.34c	20	7	30 III	119.66	(0.00) 1.10	I
15.28c	5	4	10 III	126.42	(0.25) 1.42	I
07.33			2 III	152.59		I
06.00c	20	5	40 II	156.97	(0.00w) 1.54h	I
03.80c	40	10	80 III	164.23	(0.70) 1.22 B	I
02.66	5	2	10 III	168.00		I
02.24	3	2	4 III	169.38		I
5,501.34	200	70	300 I	172.35	(0.00) 0.80	I
5,498.70	2	1	2n III	181.08		I
93.45	10	20	20 VE	198.45	(0.00w) 1.57 A²	II
91.07	5	2	8 III	206.34		I
86.86	3	5	3 V	220.31		II
82.27c	20	40	50 VE	235.57	(0.00W) 1.89 A²	II
80.72	4	25	1 VE	240.72	(0.00) 1.03h	II
75.17c	10	6	15 III	259.21	(0.00) 1.08	I
66.91	2	2	3 III	286.80		I
64.37	10	25	25 VE	295.30	(**0.00**, 0.49, 0.97) **0.00**d, 0.49, 0.97	II
58.68c	10	50	20 VE	314.37	(0.00) 1.00	II
55.14	200	40	400 I	326.25	(0.00) 1.20	I
47.59	2	10		351.65	(0.22) 1.14	II
37.55	2	2	5 III	385.54	(0.00) 2.54	I
29.86c	6	5	15 III	411.57	(0.49) 1.04	I
23.82	4	4		432.08		II
22.10			3 IIIA	437.93		I
5,415.67	4	3	8 III	459.82	(0.36) 1.56w	I
5,390.63	(?)	1		545.56		I
81.91	15	100	} 15 VE	575.61	(0.00) 0.74	II
81.77	5	50		576.10		II
80.97	40	100	80 VE	578.86	(0.00) 0.77	II
80.00	3	1	5 III	582.21		I
5,377.08	20	200	2 VE	18,592.30	(0.00w) 0.82 A¹	II

TABLE 1.—*Wave lengths and Zeeman effects in lanthanum spectra*—Continued

λ (air) I. A.	Intensity arc	Intensity spark B. S.	Arc intensity and temperature class K and C	ν (vac.) cm^{-1}	Zeeman effect	Spectrum
5,365.87	4	2	8 III	18,631.14		I
59.70	2	1	2 III A	652.59		I
57.85c	25	10	60 III	659.03	(0.00) 1.53	I
40.66	20	100	40 III E	719.09	(0.00) 1.07	II
33.42	1	2		744.50		II
30.64	1	2		754.27		I(?)
23.56	3	2	3 III	779.22		I
21.34	1	1		787.04		I
20.14	3	2	3 III	791.28		I
07.52	3	2	3 III	835.96		I
04.01c	20	5	30 III	848.43		I
03.54	50	100	100 III E	850.10	(**0.00**, 0.61) 0.57, 1.17, **1.78**	II
02.62	30	150	40 V E	853.37	(0.00) 1.16	II
5,301.97c	80	200	200 III E	855.68	(0.00 w) 1.50 w	II
5,290.83	30	50	60 III E	895.38	(0.34) 0.82 B	II
87.45	1	1	1 V	907.46		I
79.11	6	40	2 V E	937.33	(0.00) 1.20	II
76.40	5	4	10 III	947.06	(0.00) 0.90	I
71.18	100	30	150 I	18,965.82	(0.00) 1.39 A^2	I
59.38c	30	50	40 III E	19,008.37	(0.00 W) 0.46 A^1	II
57.83	4	3	3 III	013.98	(0.00) 1.07	I
57.28	—	2		015.96		II
53.45	100	30	100 I	029.83	(**0.23**, 0.69) 0.57, 1.03, 1.49, **1.95**	I
40.81	4	3	2 III	075.72		I
39.54	4	3	4 III	080.35		I
34.27c	150	40	300 II	099.56	(0.00 W) 2.10 A^2	I
26.20	2	40l	1 V E	129.05	(0.00 W) 0.32 W	II
22.48	—	3h		142.68	(0.00) 1.15	II
21.32	—	3h		146.93		II
17.83	—	10h		159.74		II
11.85c	150	40	300 II	181.72	(0.00 W) 1.73 A^2	I
5,204.14	25	300	12 V E	210.14	(0.00) 0.86 A^1 (?)	II
5,191.50	1	3h		256.91	(0.00) 1.05	II
90.34	8	4		261.21		I
88.21	40	500	25 V E	269.12	(0.00) 1.09	II
83.91	10	10(?)	20 II	285.10		I
83.42c	200	400	400 III E	286.93	(0.00) 1.31	II
79.11	2	2	2 III	302.98		I
77.30c	150	50	300 II	309.72	(0.00) 1.07	I
73.83	10	25l	10 IV (?) E	322.67	(0.00) 1.06	II
72.89	5	20l	1 V E	326.19	(0.20) 1.03	II
68.95	2	2		340.92		I
67.79	20	10	20 III	345.26		I
67.28	4	10		347.17		II
64.03			1 V (?)	359.34		I
63.61	20	40	20 V (?) E	360.92	(0.74) 1.18 B	II
62.68	2	3		364.41		II
61.54	2	1		368.68		I
58.68	40	20	80 I	379.42	(**0.19**, 0.57) 1.05, 1.45, **1.85**	I
57.43	15	150	15 V E	384.12	(0.00) 0.66	II
56.74	20	40	30 V E	386.71		II
52.31	1	1		403.38		I II
45.42	100	40	200 II	429.36	(0.00) 0.89	I
39.16	3	2		453.03		I
35.42	3	2	2 V	467.20		I
34.37	2	1		471.18		1
29.81	3	2		488.48		I
22.99	100	200	150 III E	514.43	(0.00) 1.16	II
20.87	10	4	10 III	522.51	(0.00) 0.92	I
14.55c	100	200	150 III (?) E	546.63	(0.00) 0.54	II
12.37	1	2		554.97		II
09.12	3	2	2 III A	567.40		I
07.54	—	6h		573.46	(0.00) 1.19	II
06.23c	100	40	150 II	578.48	(0.19) 0.62 A^2 (?)	I
5,103.11	3	2	2 III	19,590.45		I

TABLE 1.—*Wave lengths and Zeeman effects in lanthanum spectra*—Continued

λ (air) I. A.	Intensity arc	Intensity spark B. S.	Arc intensity and temperature class K and C	ν (vac.) cm⁻¹	Zeeman effect	Spectrum
5,096.59	2	1	1 IV (?)	19,615.51		I
90.56	2	20l	tr V E	638.74	(0.00 W) 1.33 A²	II
86.71	—	3hl		653.61		II
86.22	2	1		655.50		I
80.21	10	40	1 V E	678.76	(0.38) 0.93 w	II
79.37	4	3	5 IV	682.01		I
78.92	3	2	2 V (?)	683.76		I
72.10	3	1	1 III A	710.22		I
67.90c	15	10	15 III	726.56		I
66.99	1	20h		730.10	(0.00) 1.10 h	II
63.76	2	3		742.68		II
62.91	10	20	4 V E	746.00	**(0.00,** 0.66) 0.90, 1.56, **2.22**	II
60.85	2	3		754.04		II
58.56	—	1h		762.97		II
56.46c	60	20	80 II	771.18	(1.20) **0.00,** 0.79, 1.57	I
52.10	1	1		788.25		I
50.57	60	20	80 II	794.24	(0.80) 1.18 B	I
48.04	4	30l	1 V E	804.16	(0.00) 1.16	II
46.87c	30	15	60 III	808.75	(0.00 w) 1.24	I
37.60	2	2		845.20		I
33.24	2	1		862.40		I
19.50	10	5	8 III	916.76		I
14.45	5	30hl		936.82		II
02.12	10	40	3 V E	985.96	(0.00) 1.09	II
5,001.78c	20	6	10 III A	987.32		I
4,999.46c	100	200	200 III E	19,996.60	(0.00 w) 1.28 A²	II
96.82	6	50	2 V E	20,007.16		II
95.95	1	1		010.64		I
95.17	1	1		013.77		II
94.64	2	1	1 III A	015.90		I
93.87	15	5	20 II	018.98		I
91.27c	40	80	20 IV E	029.41	(0.00) 0.85	II
86.82c	60	100	100 III E	047.28	**(0.00,** 0.43) 0.57, 1.00, **1.43**	II
84.92	3	2	2 IV(?)	054.92		I
84.63	1	1		056.09		I
83.56	2	1		060.40		I
77.95	8	4	8 II A	083.01		I
74.20	—	4h		098.14		II
70.39	50	100	100 III E	113.55	**(0.00,** 0.29) **0.83,** 1.12 us	II
68.59	4d	3	2{III, V} A	120.84		I
64.84	3	2	4 III A	136.03		I
57.77	4	3		164.75		I
56.04	2	2	1 V	171.79		II(?)
52.06	10	40	5 V E	188.00	(0.00) 1.17	II
49.76	50	20	200 I	197.38	(0.00) 0.84	I
46.47c	20	50	20 IV(?) E	210.81	**(0.00,** 0.67) 1.05, **1.82**	II
45.84	3	2	5 III A	213.39		I
35.61	5	10	2 V E	255.28		II
34.83	40	100	20 V E	258.48	(0.00) 0.97	II
25.40	3	2	2 IV	297.27		I(?)
21.80	200	300	400 III E	312.12	(0.00) 1.11	II
20.98	200	300	400 III E	315.50	(0.00) 1.00	II
16.62	3	2	1 III(?) A	333.52		I
11.34	4	10		355.38		II
05.13	4	3	4 III A	381.15		I
04.43	1	2h		384.05		II
4,901.87	15	10	25 I	394.70	(0.00) 0.94	I
4,899.92	150	200	300 III E	402.82	(0.00) 0.80	II
94.24	2	2	1 III	426.49		I
91.43	4	10		438.23		II
87.60	4	3	5 III	454.24		I
86.82	3	2	2 IV	457.51		I
81.94	1	1		477.96		I
80.22	1	10h		485.17		II
4,878.86	10	10	15 III	20,490.89	(0.00) 1.10 R	I

TABLE 1.—*Wave lengths and Zeeman effects in lanthanum spectra*—Continued

λ (air) I. A.	Intensity arc	Intensity spark B. S.	Arc intensity and temperature class K and C	ν (vac.) cm⁻¹	Zeeman effect	Spectrum
4,874.99	1	1		20,507.15		II
70.56	5	2	5 III	525.81		I
68.90	3	1	2 IV(?)	532.80		I
67.37	3	1		539.26		I
60.90	60	80	100 III E	566.59	(0.00) 1.19	II
59.18	2	5h		573.87		II
54.95c	8	6	8 III	591.80	(0.00) 1.21 R	I
50.81	20	10	20 I	609.37		I
50.58	20	30	5 V E	610.35	(0.00) 1.03	II
43.29	4	5	1 V	641.37		II
40.02	20	30	10 V E	655.32	(0.67) 1.30(?)	II
39.51	20	10	25 II	657.49	(0.00) 0.89	I
30.51	5	10	1 V E	695.98	(0.00) 0.76 R	II
26.87c	10	20	4 V E	711.59	(0.33) 1.08 R	II
24.05	80	100	80 III E	723.70	(0.00) 0.79	II
17.55	3	2		751.66		I
17.17	10	6	4 IV(?)	753.29		I
09.00c	60	100	80 V E	788.55	(0.00) 0.51	II
04.04c	50	80	50 V E	810.02	(0.95) 0.49, **1.43**	II
4,800.24	9	6	8 III	826.49		I
4,799.99	8	5	8 III	827.57		I
96.67	10	25	4 V E	841.99		II
94.55	3	3	2 V E	851.20		II
92.46	1	1	tr III A	860.30		I
91.77	1	—		863.30		I
91.39	5	3	5 II	864.96		I
80.55c	2	2	1 V	912.27		II(?)
79.89c	4	3	4 II	915.16		I
75.14c	3	3	2 V	935.96		I(?)
70.43	10	8	15 II	956.63	(0.00) 0.93 R	I
67.80	1h	1h		968.19		I
66.89	60	30	100 I	20,972.19	(0.00) 0.99	I
59.71c	2	2	2 IV(?)	21,003.83		I
58.40	2	3		009.61		II
57.14c	3	2	2 IV	015.18		I
56.97			1 V	015.93		I
53.11c	2	1	1 IV	032.99		I
52.41c	3	2	3 III	036.09		I
50.41c	10	8	15 III	044.95	(0.00) 1.04 R	I
48.73	80	150	100 V E	052.39	(0.00) 1.00	II
43.08c	100	250	100 V E	077.47	(0.52 w) 0.95 B	II
40.27	100	120	150 III E	089.96	(0.00 w) 0.97 A[1]	II
39.80	6	15	2 V E	092.06		II
33.82c	8	5	4 V(?)	118.70		I
30.73	2	3h		132.50		II
29.09	1	—	1 V	139.82		I(?)
28.41c	80	100	80 V(?) E	142.86	(**0.00**, 0.32) 1.31, 1.61, **1.91**	II
24.42	20	40	6 V E	160.72	(0.65) 0.95 us	II
23.72	2	1	3 II	163.85		I
22.14	1	2h		170.94		II
19.93c	40	150	15 V E	180.85	(0.00) 1.06	II
17.58	10	50	4 V E	191.40	(0.50) 1.2	II
16.44c	40	80	25 V E	196.52	(**0.00**, 0.60) 0.92, 1.52, **2.12**	II
14.14	4	2	5 I	206.86		I
12.92c	20	40	12 V E	212.35	(**0.00**, 0.47, 0.92) 1.83, **2.26** R	II
08.18c	8	8	8 III (?)	233.71	(0.00) 0.97 R	I
03.27c	30	150	20 V E	255.87	(0.00 W) 1.70 A[2]	II
02.64	8	6	10 I	258.72		I
4,700.26c	8	8	8 III (?)	269.48		I
4,699.62c	20	50	20 V E	272.38		II
95.30	3	3		291.95		I
92.50c	50	200	50 V E	304.66	(0.00 W) 1.21 A[2]	II
91.17c	25	50	30 V E	310.70	(0.00, 0.46) 0.46 us	II
88.65	8	40	2 V E	322.15	(0.00) 0.96	II
4,684.39	1	2h		21,341.54		II

TABLE 1.—*Wave lengths and Zeeman effects in lanthanum spectra*—Continued

λ (air) I. A.	Intensity arc	Intensity spark B. S.	Arc intensity and temperature class K and C	ν (vac.) Cm^{-1}	Zeeman effect	Spectrum
4, 682. 12	4	5		21, 351. 89		II
73. 53	—	1h		391. 14		II
71. 82c	30	200	40 V E	398. 96	(0.00 w) 1.29h	II
68. 91c	40	250	50 V E	412. 30	(**0.00** 0.34, 0.68) 0.77, 1.12, **1.47**, 1.81 us	II
63. 76c	50	300	50 V E	435. 94	(0.20) 0.99	II
62. 51	100	200	200 III E	441. 69	(0.00 W) 0.89 A^2	II
60. 70	8	8	8 III	450. 02	(0.00) 0.92 R	I
55. 49c	80	400	150 V E	474. 02	(0.43) 1.20 B	II
53. 90c	4	3		481. 36		I
52. 07	15	30hl	20 I	489. 81		I II(?)
50. 32	12	8	15 I	497. 90	(0.30) 1.13 R	I
48. 64	30	20	40 I	505. 67	(0.48) ?	I
47. 50c	25	100	8 V E	510. 94	(**0.00**, 0.31, 0.61) 1.98 A^2	II
46. 33	10	10	12 III	516. 36	(0.00) 0.89 R	I
45. 28	40	100	40 V E	521. 22	(0.60) 1.26 B	II
43. 11c	5	5	5 III	531. 28		I
41. 40	—	2h		539. 21		II
36. 42	10	80	4 V E	562. 35	(0.21) 1.00	II
34. 95	2	25l		569. 19	(0.00) 1.43	II
33. 4	1	10hl		576. 4		II
27. 35	2	2		604. 61		I
23. 99	1	2h		620. 31		II
19. 87c	100	300	150 V E	639. 59	(0.00) 0.70	II
15. 06c	8	7	15 III	662. 14	(1.31) 1.37 R	I
13. 38	100	200	200 V E	670. 03	(**0.00**, 0.33) **0.83**, 1.16, 1.49	II
05. 78	50	100	50 V E	705. 79	(0.63) 0.89, 1.52	II
05. 08	6	3	10 III	709. 09		I
04. 24	6	4	10 III	713. 05		I
02. 04c	10	10	20 III	723. 43		I
01. 65	—	3		725. 27		II
4, 600. 59	1	5h		730. 27		II
4, 596. 19	6	6	10 I	751. 08		I
95. 06	1	2h		756. 42		II
89. 89	5	5		780. 93		I
87. 14	—	2h		793. 99		II
81. 20c	10	10	12 III	822. 25		I
80. 05	50	150	100 V E	827. 73	(0.00) 1.51	II
74. 87c	150	200	300 III E	852. 44	(0.49, **0.98**) 0.49, **0.98**, **1.46**, 1.94	II
70. 97	6	10	8 V E	871. 08	(0.43) 1.00 R	II
70. 02	60	50	250 I	875. 63	(0.00) 1.34	I
67. 90	50	40	200 I	885. 78	(0.00) 1.24	I
64. 85c	6	4	12 III	900. 41	(0.00) 1.42 R	I
62. 5	1	5h		911. 7		II
59. 28	30	100	50 V E	927. 16	(**0.00**, 0.18) 1.62	II
58. 46	100	200	250 III E	931. 10	(0.00 W) 0.88 A^1	II
52. 47	8	8	8 II A	959. 96	(0.00) 0.87	I
50. 76c	8	6	10 III A	968. 21	(0.78) 0.38 R	I
50. 16	4	3	5 III A	971. 11		I
49. 50	40	30	50 I	21, 974. 30	(0.00) 1.08	I
41. 78c	10	8	15 III	22, 011. 65		I
40. 71	3	10		016. 84	(0.00) 1.27	II
38. 87	1	8hl		025. 76		II
37. 57	2	2		032. 07		I
30. 54	4	15	2 V E	066. 26		II
28. 88	3	2		074. 34		I
26. 12	100	200	200 III E	087. 81	(0.00 W) 1.01 A^1	II
25. 31c	40	100	20 V E	091. 76	(0.46) 1.19 B	II
22. 37	200	400	500 III E	106. 12	(0.00) 1.02	II
16. 38	2	5hl		135. 44		II
08. 48	3	10		174. 22	(0.00) 0.90	II
07. 4	2	2		179. 5		I
05. 82	1	3hl		187. 32		II
02. 16	1	10hl		205. 35	(0.00) 1.47	II
01. 57	6	4	10 II A	208. 26		I
4, 500. 21	30	30	40 II	22, 214. 97	(0.00 W) 1.10 A^1	I

TABLE 1.—*Wave lengths and Zeeman effects in lanthanum spectra*—Continued

λ (air) I. A.	Intensity arc	Intensity spark B. S.	Arc intensity and temperature class K and C	ν (vac.) cm⁻¹	Zeeman effect	Spectrum
4,499.04c	10	10	10 III	22,220.75	(0.00) 1.02	I
98.76	2	10		222.13	(0.00) 1.14	II
97.00	2	2		230.83		II
94.71c	20	15	30 I	242.16	(0.51) 0.27, **0.58**, 0.91 us	I
93.81	5	3	10 IA	246.61	(0.00) 0.72 R	I
93.11	15	10	25 I	250.08	(0.00) 1.16	I
91.76c	10	8	15 III	256.76	(0.00) 1.52	I
86.05	10	10	20 III	285.04		I
84.48	—	1h		292.90		II
81.21	3	25hl		309.16	(0.40) **0.50**, 0.87	II
79.82c	6	5	15 II A	316.08		I
74.54	4	3	5 III A	342.42		I
74.03	2	10		344.96	(**0.00**, 0.66) 0.50, 1.17, **1.83**	II
68.97	10	6	25 II	370.26		I
59.10	—	3		419.78		II
55.79	20	50	25 V E	436.43	(0.24) 1.41	II
55.21	3	2	10 II A	439.35		I
53.85			2 IV A	446.20		I
52.15	15	15	30 II	449.78	(0.00) 0.98	I
45.12	2	1	2 III A	490.79		I
43.94c	5	20hl	10 I	496.26	(0.00) 1.18 h	I II?
42.68	6	3	12 II	502.64		I
35.84	6	10	6 IV E	537.34	(**0.00**, 0.60, 1.19) 1.28, 1.86, **2.44**	II
32.95	10(?)	20(?)		552.03		II+M
29.90c	200	400	500 III E	567.56	(**0.00**, 0.40) 0.51, 0.91, **1.31**	II
27.52c	30	100	40 V E	579.69	(0.00w) 1.06	II
23.90	20	15	30 II	598.16	(0.00) 1.09	I
19.16	20	30	6 V E	622.41	(0.28) 1.04	II
17.14	2	2h	6n III	632.75		I II
13.45			2 III A	651.67		I
12.22	—	2h		657.98		II
11.21	1	25hl	2 V E	663.17	(0.00h) 1.13h	II
03.02c	2	2	8 III A;	705.33		I II?
4,402.64	5	4	15 III	707.29	(0.00) 0.86	I
4,397.04			2 IV A	736.21		I
96.79c			4 IV A	737.50		I
96.31			2 IV	739.98		I
93.52c	2	1	4 III	754.42		I
89.87	6	4	15 III	773.34	(0.00) 1.07	I
85.20c	10	40	20 V E	797.59	(0.00) 1.24	II
83.44	20(?)	100	25 V E	806.75	(**0.00**, 0.40, 0.80) 0.28, 0.68, 1.08, 1.48, **1,88**	II+M
80.55	4	2	12 II A	821.79		I
78.10c	15	50	15 IV E	834.56	(0.30w) 0.95	II
64.66c	25	100	30 IV E	904.88	(0.00) 1.28	II
63.05	5	50l	4 V E	913.33	(00.0h) 1.32h	II
60.86	2	?	2 III A	924.84		I
60.49	2	2	2 III A	926.78		I
57.88	2	1	2 III A	940.51		I
56.18	—	1		949.46		II
54.79	20	?	25 III	956.79		I
54.40	60	200	80 IV E	22,958.84	(0.00) 1.08	II
40.72c	10	6	15 III	23,031.20	(0.00) 0.90	I
39.93	5	3	6 III A	035.39		I
37.78	2	10l		046.81	(0.00) 1.08h	II
34.96c	50	100	60 V E	061.80	(**0.00**, 0.29, 0.57) 0.69, 0.97, 1.26, **1.54**	II
33.76c	300	500	600 III E	068.19	(0.17) 0.94	II
26.19	2	2		108.55		I
22.51c	60	100	130 III E	128.22	(0.00) 1.10	II
15.90c	10	30	12 V E	163.65	(**0.00**, 0.50, 1.00) 0.86, 1.36, 1.86, **2.36**	II
11.73c	5	4	4 III A	186.05	(0.59) 0.96 R	I
4,306.00	6	5	6 II A	23,216.90	(0.14) 1.49	I

TABLE 1.—*Wave lengths and Zeeman effects in lanthanum spectra*—Continued

λ (air) I. A.	Intensity arc	Intensity spark B. S.	Arc intensity and temperature class K and C	ν (vac.) cm^{-1}	Zeeman effect	Spectrum
4,304.11	1	10hl		23,227.10	(0.00h) 1.24h	II
00.62	H. N. R.		3	245.94		I
4,300.44	40	60	30 IV E	246.92	(0.73, **1.48**) 0.00, **0.72, 1.45,** 2.18	II
4,296.05c	100	300	200 IV E	270.67	(0.00) 1.48	II
91.00	2	2		298.06		I
89.65	H. N. R.		1	305.39		I
89.01	H. N. R.		2	308.87		I
86.97c	80	300	150 V E	319.96	(0.00) 1.08	II
80.27	60	40	100 I	356.46	(0.00) 1.14	I
75.64	50	100	60 IV E	381.75	(**0.00,** 0.35) 0.82, 1.17, **1.52**	II
71.14	4	3		406.39		I
69.50c	80	300	150 V E	415.38	(0.00) 1.20	II
67.74	2	2		425.04		I
63.59c	60	200	100 V E	447.83	(0.00) 1.12	II
62.35	10	5	15 II A	454.66	(0.00w) 1.19	I
59.51	—	2h		470.30		II
56.92c	6	5	6 III A	484.58	(0.00) 1.29 R	I
56.50	—	3		486.89		II
52.93	3	4		506.61		II
49.99c	20	100	25 V E	522.87	(0.74) 0.50, 0.76, **1.02, 1.27,** 1.53, 1.76	II
48.32	—	2		532.11		II
41.20	1	15hl		571.62		II
38.59	4	(?)	10 III A	586.13		I
38.38c	200	400	400 III E	587.30	(0.74) 0.56, 0.82, **1.08, 1.34,** 1.60, 1.86	II
30.95c	20	150	30 V E	628.72	(0.80) 0.65, 0.85, **1.06, 1.26,** 1.47, 1.67 ur	II
17.56c	40	200	80 V E	703.74	(0.00) 1.22	II
16.54	4	3		709.47		I
10.22	4	50hl		745.06	(0.00h) 1.02h	II
07.61	2	10l		759.79	(0.27) 0.68h	II
04.03	40	100	100 V E	780.02	(0.00) 1.48	II
4,201.50		6h		794.34		II
4,196.55c	150	250	300 III E	822.41	(0.32, **0.64**) 0.51, **0.82, 1.13,** 1.44	II
94.36	4	30h		834.85	(0.00h) (1.06h)	II
93.34	1	5		840.64	(0.25) 0.64	II
92.72	H. N. R.		2	844.17		I
92.35c	40	100	80 V E	846.27	(0.00) 1.06	II
87.31	50	30	125 I	874.98	(0.00w) 1.16 A^2	I
80.97	2	12l		911.18		II
77.48	15	10	30 I	931.15	(0.00) 1.50	I
72.32	6	4	10 III A	960.75		I
71.13	5	4	8 III A	23,967.58		I
63.31	5	4	8 III A	24,012.60		I
61.94	2	8h		020.51	(0.00h) 1.02	II
60.26	20	10	30 I	030.21	(0.00W) 1.65 w	I
57.52	6	5	10 II A	046.04		I
54.59	—	2h		063.00		II
52.78	40	100	40 IV(?) E	073.49	(0.43, **0.84**) 0.27, **0.67, 1.08,** 1.48	II
51.98c	100	250	300 III E	078.13	(0.29) 0.50, **0.77**	II
50.24	2	2		088.22		I
48.2	—	4h		100.1		II
44.36	4	2		122.40		I
43.92	5	(?)	12 III A	124.96		I
43.77	6	15		125.83		II
41.73c	80	200	{40 / 50} IV E	137.72	(0.00W) 1.50w	II
37.91	—	2		160.00		II
37.05	20	10	40 I	165.02	(0.00) 1.22	I
33.33	—	6hl		186.77	(0.00) 0.97	II
32.50	1	10hl		191.63	(0.00h) 0.83h	II
31.74	—	5h		196.08	(0.00h) 1.13h	II
4,123.23	200	400	600 III E	24,246.01	(0.00) 1.05	II

TABLE 1.—*Wave lengths and Zeeman effects in lanthanum spectra*—Continued

λ (air) I. A.	Intensity arc	Intensity spark B. S.	Arc intensity and temperature class K and C	ν (vac.) cm⁻¹	Zeeman effect	Spectrum
4,117.67	8	5	20 III	24,278.75	(0.00) 0.93	I
15.35	—	1h		292.44		II
13.28	2	40l		304.66	(0.00h) 1.09h	II
09.80	10	6	20 I A	325.24	(0.00) 1.04	I
09.48	6	3	15 II A	327.14	(0.00) 1.26	I
04.87	30	20	60 I	354.46	(**0.08**, 0.25) 0.53, 0.69, **0.85** ur	I
4,101.01	—	3h		377.38		II
4,099.54c	40	150	60 V E	386.12	(0.00) 0.77	II
98.73	1	5		390.94		II
90.40	2	1		440.61		I
89.61	25	12	50 I	445.33	(0.00) 0.93	I
86.72	200	300	400 III E	462.62	(0.32) 0.79 w	II
79.17	20	10	40 I	507.90		I
77.35c	200	300	400 III E	518.84	(**0.00**, 0.32) 0.57, 0.89, **1.20**	II
76.71	10	40	30 IV E	522.68	(**0.00**, 0.31, 0.62) 0.79, 1.08, 1.38, **1.69**	II
67.39c	60	100	125 IV E	578.88	(0.00w) 1.14 A^2	II
65.58	15	6	30 II	589.82		I
64.79	25	15	50 II	594.60	(0.00w) 1.03 A^1	I
60.33	30	20	60 II	621.61	(0.00w) 1.10 A^1	I
58.08	2	5l		635.26	(0.45) 1.06, 1.47us	II
50.08c	50	200	60 V E	683.92	(0.00) 1.02	II
42.91	150	300	300 IV E	727.70	(0.00) 0.99	II
40.97	2	1		739.57		I
37.21	25	10	50 I	762.61	(0.00) 0.86	I
36.59c	7	15d	8 V E	766.41	(0.00) 1.54	II
31.68	100	300	300 III E	796.57	(0.00) 1.15	II
25.87	20	50	40 IV E	832.36	(0.00W) 1.37 A^2	II
23.58c	10	40	15 IV E	846.49	(0.00) 1.07	II
20.19	—	2h		867.44		II
15.39	25	15	50 I	897.17	(**0.10**, 0.31) **0.90**, 1.10, 1.30, 1.48ur	I
07.64	1	7h		945.32	(0.00W) 1.01h	II
4,001.38	2	2		24,984.34		I
3,995.74c	200	400	600 III E	25,019.61	(0.30) 0.90w	II
94.50c	4	10		027.37	(0.57h) 1.25h	II
88.51c	300	500	800 III E	064.96	(0.00) 1.32	II
81.36	2	10l		109.97	(0.38) 0.98 h us	II
79.08	1	8l		124.35	(0.00) 1.26	II
63.04	1	5l		226.04	(0.00w) 0.82h	II
62.03	1	10l		232.47	(0.00) 1.10h	II
58.53	—	2		254.78		II
57.25	—	2		262.95		II
56.07	1	4		270.48	(0.00h) 1.29h	II
55.21	—	3h		275.98	(0.00) 1.15	II
53.67	10	5	40 II	285.83		I
53.36	—	2		287.81	(0.00) 1.06	II
51.43	1	3h		300.16		II
49.10c	400	600	1000 III E	315.09	(0.00) 1.13w	II
44.15	2	3		346.86	(0.00) 1.18h	II
39.85	2	20l		374.52	(0.21) 1.27h	II
36.22	20	50	60 IV E	397.92	(**0.00**, 0.25, 0.48) 0.86, 1.10, 1.34, **1.58**	II
32.53	3	10l		421.75	(0.44) 1.06 B	II
30.47	—	3		435.07	(0.00) 0.92	II
29.22c	100	300	500 III E	443.17	(0.00) 1.20	II
27.56	30	10	80 I	453.92	(0.00) 0.76	I
25.09	1	5		469.94		II
24.69	—	3		472.53	(0.00h) 0.72h	II
21.54c	70	200	300 III E	492.99	(**0.00**, 0.66) 0.52, 1.18, **1.84**	II
16.05c	80	300	400 III E	528.73	(0.38) **0.51**, 0.88	II
10.81	4	10l	15 IV (?) E	562.94	(0.00) 1.04	II
3,902.57	5	3	20 II	616.91		I
3,898.60	8	4	40 II	642.99		I
97.43	2	4		650.70		II
95.65			8 IV	662.42		Fe(?)
92.47	—	3		683.37	(0.00h) 1.4h	II
92.05	—	3		686.15		II
3,886.37	60	150	400 III E	25,723.69	(0.00W) 1.62 A^2	II

TABLE 1.—*Wave lengths and Zeeman effects in lanthanum spectra*—Continued

λ (air) I. A.	Intensity arc	Intensity spark B. S.	Arc intensity and temperature class K and C	ν (vac.) cm⁻¹	Zeeman effect	Spectrum
3,885.09	1	4		25,732.16		II
71.64	100	200	300 III (?) E	821.56	(0.00) 1.08	II
68.35	—	3h		843.52		II
64.49	6	100l		869.33	(0.00h) 1.10h	II
63.11	—	2		878.57		II
60.31	—	2		897.34		II
54.91	15	30		933.62	(0.00) 1.50	II
49.02	40	100	200 III (?) E	973.30	(0.00) 0.69	II
46.00	10	20	20 V (?) E	25,993.69	(0.36) 1.11 B	II
40.72	40	60	50 V (?) E	26,029.43	(0.00) 1.04	II
36.4	—	1		058.7		II
35.09	15	50	20 V E	067.64	(0.00) 1.49	II
17.24	1	8h		189.53	(0.00) 0.82h	II
16.25	2	10h		196.33	(0.00 h) 0.68	II
14.1	—	2		211.1		II
08.79	10	15		247.63	(0.00w) 1.18h	II
07.1	—	1		259.3		II
04.8	—	2h		275.2		II
3,801.0	—	1		301.4		II
3,798.19	—	2		320.88		II
94.78	150	400	600 III E	344.54	(0.00) 1.16	II
90.83	100	300	600 III E	371.99	(0.00) 1.00	II
84.81	8	15	20 V E	413.93	(0.17) 0.79	II
83.06	—	1		426.15		II
80.67	20	50 (?)	50 V E	442.85	(0.00) 1.54	II
80.53	5	50 (?)		443.84	(0.00h) 0.92h	II
73.12	10	150l		495.77	(0.00) 1.00h	II
68.98	1	3h		524.87		II
67.05	1	5h		538.46	(0.47) 1.24 B	II
66.58	1	3h		541.77		II
59.08	100	300	600 III E	594.72	(0.00) 1.25	II
53.04	—	2h		637.52		II
47.96	1	5l		673.63	(0.00w) 0.90h	II
44.85	—	2h		695.78		II
36.41	2	15l		756.08	(0.37) 1.20 B	II
35.85	6	10	20 IV E	760.09	(0.00w) 0.90d	II
35.09	—	1		765.53		II
31.42	1	8h		791.86		II
28.97	—	2h		809.46		II
25.05	10	20	40 IV E	837.67	(**0.00**, 0.38, 0.75) 0.79, 1.16, 1.53, **1.90**	II
24.77			2 V	839.69		
20.75	—	2		868.69		II
17.99	1	2		888.63		II
15.53	20	50	80 IV E	906.44	(0.40, **0.72**) 0.80, **1.13**, **1.46**, 1.79	II
14.87	10	40	60 V E	911.22	(0.00) 1.50	II
14.30	2	2		915.34		I
13.54	30	100	300 IV E	920.85	(**0.00**, 0.34, 0.68) 1.00, 1.35, 1.69, **2.03**	II
10.61	—	2		942.11		II
05.81c	25	80	125 V E	977.01	(0.00) 1.51	II
04.54	10	4	40 II	26,986.25	(0.00) 1.08	I
3,701.81	4	40l	4 V E	27,006.15	(0.00W) 0.73A[1]	II
3,699.57	4	2	12 III A	022.51		I
96.11	—	2h		047.80		II
95.2	—	2h		054.5		II
94.27	2	7h		061.27	(0.36) 0.88h	II
92.31	—	2h		075.64		II
78.24	—	2h		179.20		II
75.22	—	1		201.54		II
72.02	8	4	30 III	225.24		I
70.23	1	4h		238.52	(0.30) 1.06	II
69.27	—	3h		245.65		II
65.22	2	10l		275.75	(0.00d) 1.92d	II
62.08	15	30	50 IV E	299.14	(0.66) 1.16 B	II
58.40	1	3		326.60	(0.00) 1.0	II
3,658.04	—	1		27,329.29		II

TABLE 1.—*Wave lengths and Zeeman effects in lanthanum spectra*—Continued

λ (air) I. A.	Intensity arc B. S.	Intensity spark B. S.	Arc intensity and temperature class K and C	ν (vac.) cm⁻¹	Zeeman effect	Spectrum
3,652.62	—	1h		27,369.84		II
50.19	25	80	125 V E	388.06	(0.48, **0.91**) 0.29, **0.73, 1.18**, 1.62	II
49.55	10	6	40 II	392.86	(0.00) 1.00	I
45.43	50	200	400 IV E	423.82	(0.00) 0.66	II
41.66	10	50l		452.21	(0.00) 1.21	II
41.53	20 (?)	(?)	100 II (+E)	453.19		I
41.10	—	2		456.43	(0.00) 1.01	II
39.25	1	3h		470.39		II
37.15c	10	40	50 V E	486.25	(0.00) 1.51	II
36.67	6	2	40 III	489.88		I
29.99	1	2hl		540.46		II
28.83	20	60	125 IV E	549.27	(0.00W) 1.68 A [2]	II
21.77	2	4	4 V E	602.97		II
20.16	1	1		615.24		II
18.60	—	1		627.15		II
13.08	10	4	30 II	669.36	(0.00) 0.97	I
12.34	5	50	8 V E	675.02	(0.00) 1.11	II
11.09	1	2		684.60	(0.00) 1.57h	II
10.25	4	30 l		691.04	(0.00) 1.02	II
09.22	—	4		698.95	(0.00) 1.00	II
08.18	—	4		706.93	(0.00w) 1.08 A [2]	II
06.42	—	4hl		720.45		II
3,601.07	5	20hl	15 V E	761.63	(0.00) 1.18	II
3,598.93	—	3hl		778.14	(0.00) 1.15	II
96.65	—	4hl		795.75	(0.00) 1.22	II
93.29			2 V E	821.74		
92.42	—	2h		828.48		II
90.66	—	1h		842.11		II
85.53	—	2		881.95	(0.00) 1.25	II
81.68	1	20hl		911.92	(0.00) 0.74	II
80.10	—	8h		924.24	(0.00) 1.52	II
78.89	—	5 h		933.68	(0.00) 1.44	II
76.56	—	2hl		951.88		II
74.43	20	6	50 II	27,968.53	(0.00) 0.83	I
70.10	(?)	30hl		28,002.38	(0.00) 1.08	II
57.26	3	8	20 IV (?) E	103.53		II
50.82	3	6	15 IV (?) E	154.49		II
36.37	—	3h		269.53		II
33.67	—	3h		291.13		II
30.67	4	8	20 V (?) E	315.17		II
26.77	—	2h		346.48		II
20.72	2	10hl		395.19	(0.00) 0.88	II
17.14c	5e	200	— V E	424.09	(0.73) 1.36	III
14.87	—	2h		442.45		II
14.07	6	3	20 II A	448.92		I
12.93	5	10	25 IV E	458.15	(0.53) **0.53**, 1.10	II
10.00	6	15	25 IV E	481.91		II
3,507.90	—	4hl		498.96		II
3,493.97	—	2h		612.58		II
84.39	2	10l		691.25	(0.00) 1.33	II
80.61	3	2	8 III A	722.40		I
74.84	2	8l		770.10		II
66.46	—	1h		839.64		II
62.32	—	2h		874.13		II
61.18	10	3	25 III A	883.64		I
60.31	2	5l		890.90		II
53.17c	40	50	70 III E	950.63	(0.93) 0.37, 0.68, **1.00, 1.31**, 1.63, 1.94.	II
52.18c	30	40	50 III E	958.94	(0.00) 0.95	II
51.12	—	3l		967.83		II
50.65	5	2	12 III A	28,971.78		I
32.81	2	5		29,122.34		II
27.57	2	8		166.85		II
23.9	3	5		198.1		II
22.44	1	2		210.57		II
3,420.54	1	5h		29,226.80		II

TABLE 1.—*Wave lengths and Zeeman effects in lanthanum spectra*—Continued

λ (air) I. A.	Intensity arc	Intensity spark B. S.	Arc intensity and temperature class K and C	ν (vac.) cm⁻¹	Zeeman effect	Spectrum
3,411.76	2	20hl		29,302.01	(0.00 w) 1.48	II
07.00	1	8hl		342.95	(0.00) 1.50	II
3,404.53	10	3	15 III A	364.24		I
3,398.29	1	2h		418.15		II
97.77	4	40hl	4 V E	422.65	(0.24) 0.85	II
92.94	1	4h		464.54		II
90.40	1	4h		486.61		II
88.61	6	2	12 II A	502.18		I
81.42			15 II A	564.92		I
80.91	200	300	400 III E	569.36	(**0.00**, 0.37) **0.75**, 1.11, 1.47	II
76.33	40	50	40 III E	609.49	(0.00) 0.88	II
74.89	1	3		622.12		II
68.36	3	—		679.54		I
64.88	2	—		710.24		I
62.04	7	3	12 III A	735.33		I
57.50	5	2	7 III A	775.54		I
51.89	—	3		825.37		II
49.82	2	—	3 III A	843.80		I
44.56	150	200	300 III E	890.73	(0.00) 0.53	II
42.23	10	5	20 II A	911.57	(0.00) 1.08	I
37.49	200	300	500 III E	29,954.05	(0.00w) 1.12 A¹	II
29.07	2	8		30,029.81		II
26.21	1	5		055.63		II
25.33	1	3		063.59		II
10.62	1	4		197.16		II
06.98	7	8	10 IV E	230.40	(0.00) 1.77 R	II
3,303.11c	100	150	200 III E	265.82	(1.00) 0.51, **1.51**	II
3,298.72	—	5h		306.09		II
97.15	1	3		320.52		II
94.44	1	10		345.46		II
83.95	1	8h		442.39		II
77.83	—	4		499.23		II
67.31	1	3		597.43		II
65.67c	80	100	150 III E	612.79	(0.48, **0.80**) 0.82, **1.17**, **1.51**, 1.86	II
63.98	2	5		628.64		II
56.60	2	1		698.05		I
53.41	2	10h		728.15	(0.00) 0.65	II
49.35	60	80	100 III E	766.54	(**0.00**, 0.50), **0.46**, 0.94, 1.44	II
47.06	5	2	8 II A	788.24		I
45.13	100	150	200 III E	806.55	(0.00) 1.04	II
35.66	3	2	5 III A	896.71		I
26.03	1	2		30,988.93		II
24.71	—	1		31,001.62		II
17.12	2	8h		074.76		II
15.81	10	2	15 II A	087.42	(0.00) 1.13	I
12.56	1	5		118.86		II
09.13	2	6		152.12		II
08.13	1	6		161.83		II
05.75	3	4		184.96		II
3,204.55	1	3		196.64		II
3,194.70	—	2		292.83		II
93.02c	15d	25	{ 10(?) IV E 15(?) IV E }	309.29	(**0.00**, 0.96) 0.61, 1.58, **2.54**	II
91.39	1	10h		325.28		II
79.78	4	2	8 III A	439.65		I
75.99	8	2	15 II A	477.17		I
74.88	1	10hl		488.18		II
71.68c	8e	300	— V E	519.94	(0.37) **0.99**, 1.76	III
66.26	1	2		573.90		II
65.19	1	4		584.57		II
60.56	1	3		630.84		II
57.58	1	2		660.69		II
56.35	—	2		673.02		II
48.51	4	2	4 III A	751.89		I
45.7	1	2h		780.3		II
3,142.76	30	40	50 IV E	31,809.98		II

TABLE 1.—*Wave lengths and Zeeman effects in lanthanum spectra*—Continued

λ (air) I. A.	Intensity arc	Intensity spark B. S.	Arc intensity and temperature class K and C	ν (vac.) cm⁻¹	Zeeman effect	Spectrum
3,132.14	—	3		31,917.83		II
30.25	—	2		937.10		II
25.72	1	4hl		31,983.39		II
12.63	1	8h		32,117.88		II
09.42	8	3	12 II A	151.04		I
08.46	6	8	5 IV E	160.97		II
3,104.58	40	50	60 IV E	201.16	(0.00 W) 1.50 A [2]	II
3,096.02	8	2	10 II A	290.19		I
94.76	—	4h		303.34		II
88.53	—	4h		368.49		II
81.42	1	6h		443.18		II
75.51	—	4h		505.52		II
69.45	—	3		569.69		II
68.96	—	4		575.09		II
59.91	1	8		671.23		II
54.02	2	6		734.24		II
49.39	2	5		783.94		II
45.63	—	1		824.41		II
36.43	1	2		923.86		II
35.8C	—	1		32,930.69		II
28.64	—	2		33,008.54		II
25.88	—	4(?)		038.65		II
22.26	1	5hl		078.22		II
18.95	1	6hl		114.48		II
10.78	4	3	2 IV A	204.34		I
07.32	2	5		242.54		II
04.68	—	5h		271.74		II
3,001.41	2	—		307.99		I
2,992.99	2	—		401.69		I
85.76	1	2		482.57		II
85.43	2	5		486.27		II
84.33	2	3		498.61		II
83.44	—	3		508.61		II
76.83	—	3		583.01		II
71.48	—	1		643.47		II
66.55	1	4		699.38		II
66.08	—	2		704.72		II
62.90	2	15		740.89		II
59.85	2	5		775.65		II
58.71	—	1		788.67		II
51.46	1	3		871.66		II
50.50	8	50	2 V E	882.68	(0.00) 1.04	II
48.82	—	1		901.99		II
43.56	1	6hl		33,962.57		II
39.64	—	3h		34,007.85		II
29.86	1	7		121.37		II
25.15	1	5h		176.31		II
23.90	2	20		190.92	(0.00) 1.23 (?)	II
13.60	—	2		311.78		II
10.05	—	1		353.63		II
09.65	2	—		358.36		I
05.53	1	4hl		407.07		II
2,904.62	1	—		417.85		I
2,899.80	1	4hl		475.06		II
97.76	2	5hl		499.32		II
93.08	10	60	4 V E	555.14	(0.00) 1.12	II
89.11	—	1		602.61		II
85.13	10	50	4 V E	650.35	(0.00) 1.04	II
83.35	—	1		671.74		II
80.65	8	40	3 V E	704.23	(0.00) 1.18	II
76.55	—	1		753.69		II
74.28	—	3		781.14		II
73.20	—	2		794.21		II
67.47	1	2h		863.74		II
2,862.98	5	15hl	1 V E	34,918.41		II

TABLE 1.—*Wave lengths and Zeeman effects in lanthanum spectra*—Continued

λ (air) I. A.	Intensity arc	Intensity spark B. S.	Arc intensity and temperature class K and C	ν (vac.) cm^{-1}	Zeeman effect	Spectrum
2,862.37	3	6		34,925.85		II
59.76	3	5		34,957.73		II
55.90	10	50hl	1 V E	35,004.97	(0.00) 1.13	II
53.72	1	4h		031.71		II
49.51	1	2h		083.47		II
48.34	3	6		097.88		II
46.67	1	5		118.47		II
43.67	1	4		155.51		II
40.51	3	25hl		194.62		II
38.45	3	5l		220.16		II
32.53	1	5		293.77		II
25.82	—	1		377.57		II
25.51	1	5		381.45		II
21.03	1	5		437.64		II
19.73	1	2		453.97		II
18.40	1	3		470.70		II
17.46	2	—		482.54		I
15.36	3	6		509.00		II
13.72	2	5		529.70		II
13.05	1	3		538.16		II
09.35	1	2		584.96		II
08.39	40	150	10 V E	597.13	(0.00) 1.04	II
07.20	—	1		612.22		II
05.58	3	5		632.78		II
2,804.55	2	4		645.86		II
2,798.56	8	40hl	1 V E	722.15	(0.00) 1.08	II
96.40	3	5		749.75		II
94.03	4	1		780.07		I
91.51	8	25		812.37	(0.00) 1.04R	II
81.25	—	1		944.47		II
80.23	4	20		957.66		II
79.78	2	10		963.48		II
78.76	2	10		35,976.68		II
73.86	—	1		36,040.23		II
67.40	1	8		124.35		II
66.46	4	1		136.62		I
61.56	7	1		200.74		I
61.10	1	5		206.77		II
60.51	1	3		214.51		II
59.54	4	1		227.24		I
59.14	—	3		232.49		II
58.65	—	3		238.93		II
56.57	2	—		266.27		I
55.57	—	1		279.43		II
52.84	1	10		315.41		II
49.52	2	—		359.25		I
48.31	1	8		375.26		II
39.25	4	1		495.56		I
37.49	3	1		519.03		I
36.90	—	2		526.90		II
36.41	—	3		533.44		II
32.40	1	10		587.05		II
30.15	2	—		617.20		I
29.85	5	2		621.22		I
27.5	—	2		652.8		II
26.48	—	1		666.49		II
25.57	15	3		678.73		I
22.31	6	2		722.65		I
21.45	—	2		734.25		II
17.33	2	—		789.90		I
15.77	3	—		811.08		I
15.43	1	10hl		815.68		II
14.52	8	1		828.03		I
12.51	—	1		855.32		II
2,710.69	4	1		36,880.06		I

TABLE 1.—*Wave lengths and Zeeman effects in lanthanum spectra*—Continued

λ (air) I. A.	Intensity arc	Intensity spark B. S.	Arc intensity and temperature class K and C	ν (vac.) cm⁻¹	Zeeman effect	Spectrum
2,709.92	—	3		36,890.54		II
07.07	3	1		929.38		I
06.49	—	2		937.29		II
2,702.13	5	8		36,996.88		II
2,695.47	15	35		37,088.29		II
94.21	—	5		105.64		II
91.60	—	1		141.62		II
87.75	—	2		194.81		II
84.90	—	50hl		234.29		III
84.11	6	1		245.25		I
82.46	—	30hl		268.16		III
81.49	4	10		281.64		II
79.87	—	4h		304.17		II
77.77	2	—		333.43		I
75.66	2	5		362.87		II
73.74	1	3		389.70		II
72.90	15	30		401.45		II
72.06	—	2		413.20		II
71.91	2	—		415.30		I
70.05	—	2		441.37		II
66.54	1	3		490.65		II
66.18	2	6		495.71		II
65.62	—	4		503.59		II
64.75	1	3		515.83		II
62.73	—	1h		544.29		II
61.66	1	3		559.38		II
61.36	1	4		563.61		II
53.48	2	—		675.16		I
51.60	—	300hl		701.87		III
49.61	—	1		730.18		II
47.36	1	4		762.25		II
47.13	2	—		765.53		I
44.70	—	1		800.23		II
42.27	—	1		834.96		II
40.15	—	1		865.37		II
39.00	1	5		881.87		II
36.66	—	1		915.48		II
31.94	2	8		983.47		II
31.52	1	4		37,989.54		II
20.01	2	7		38,156.42		II
17.29	—	1		196.07		II
16.32	2	7hl		210.23		II
13.09	1	4		257.46		II
10.34	50	150		297.76		II
04.18	—	1		388.35		II
02.87	—	1		407.66		II
01.79	1	5		423.60		II
00.86	—	2		437.34		II
2,600.33	1	4		445.18		II
2,596.32	1	3		504.55		II
96.08	6	20		508.11		II
92.87	—	3h		555.78		II
86.35	2	10		652.97		II
82.96	1	8		703.70		II
82.55	2	6		709.85		II
80.82	3	8hl		735.79		II
77.92	—	2		779.36		II
73.47	—	2h		846.42		II
66.09	3	10hl		38,958.13		II
61.84	2	20l		39,022.75		II
60.37	10	50		045.15		II
58.99	—	3		066.21		II
58.72	—	2		070.33		II
53.41	—	3h		151.57		II
2,552.60	—	7		39,164.00		II

TABLE 1.—*Wave lengths and Zeeman effects in lanthanum spectra*—Continued

λ (air) I. A.	Intensity arc	Intensity spark B. S.	Arc intensity and temperature class K and C	ν (vac.) cm⁻¹	Zeeman effect	Spectrum
2,552.36	—	2		39,167.68		II
46.40	4	20hl		259.35		II
42.40	—	6		321.11		II
41.60	1	4		333.49		II
38.40	—	2		383.07		II
36.76	—	3		408.53		II
34.98	2	6		436.21		II
33.14	10	15		464.84		II
31.60	—	8		488.84		II
30.26	—	1		509.76		II
27.84	—	3		547.58		II
23.07	1	5hl		622.34		II
19.22	10	50		682.89		II
15.79	—	4		736.99		II
14.59	—	3		755.95		II
2,501.18	1	15hl		969.08		II
2,499.69	—	1		39,992.91		II
95.82	—	2		40,054.91		II
94.90	—	1		069.68		II
87.59	10	40		187.42		II
83.00	1	5hl		261.71		II
79.85	5?	10l		312.85		II
78.8		20hl		329.9		III
76.72	—	100hl		363.79		III
74.50	—	3		400.00		II
72.44	1	10		433.65		II
71.90	15	20		442.49		II
71.06	—	5		456.23		II
70.55	—	3		464.58		II
68.11	—	1		504.58		II
58.15	—	2		668.69		II
55.88	—	10		706.28		II
54.30	—	1		732.48		II
52.73	1	8		758.55		II
51.59	—	2		777.50		II
45.56	—	10h		878.04		II
43.14	—	2h		918.53		II
42.80	—	3		924.22		II
39.08	—	2		986.63		II
38.42	—	10		40,997.82		II
38.02	2	20		41,004.45		II
37.14	1	10		019.26		II
36.42	1	15		031.37		II
31.40	—	6h		116.08		II
24.53	—	2h		232.58		II
21.61	—	5h		282.29		II
20.01	1	5hl		309.58		II
17.61	—	3h		350.59		II
12.08	—	2h		445.38		II
10.10	—	5hl		479.43		II
07.79	—	5hl		519.22		II
04.65	—	6		573.43		II
03.29	1	7		596.96		II
2,401.46	—	2h		628.66		II
2,399.64	3	20hl		660.22		II
98.70	—	3h		676.55		II
97.26	1	7hl		701.57		II
94.98	—	4		741.27		II
93.27	—	2h		771.10		II
89.84	—	3hl		831.04		II
88.96	—	2		846.45		II
86.26	—	2		893.80		II
84.28	—	3h		41,928.58		II
79.38	5e	200h		42,014.92		III
75.63	—	2h		081.24		II
2,370.47	—	2		42,172.84		II

TABLE 1.—*Wave lengths and Zeeman effects in lanthanum spectra*—Continued

λ (air) I. A.	Intensity arc	Intensity spark B. S.	Arc intensity and temperature class K and C	ν (vac.) cm⁻¹	Zeeman effect	Spectrum
2,369.18	—	2		42,195.79		II
65.50	—	3		261.43		II
58.02	—	3h		395.48		II
56.10	—	1h		430.02		II
55.81	—	5h		435.24		II
53.40	—	2		478.70		II
53.03	—	1		485.48		II
51.93	—	1		505.24		II
48.86	—	2		560.79		II
41.85	—	4		688.18		II
28.75	4	20hl		42,928.29		II
22.78	—	3h		43,038.62		II
19.44	15	20		100.59		II
17.82	5	20hl		130.71		II
2,311.45	—	1		249.56		II
2,297.75	4e	200hl		507.40		III
93.47	—	2h		588.59		II
92.32	1	3		610.45		II
80.94	—	4h		828.01		II
76.06	—	1h		43,921.97		II
65.54	—	3		44,125.90		II
56.77	40	50		297.36		II
30.74	—	7		44,814.20		II
16.08	2e	100hl		45,110.63		III
07.08	—	1		294.56		II
2,202.76	—	1		383.38		II
2,195.91	—	4		524.94		II
90.67	—	1		633.82		II
87.87	30	40		45,692.22		II
63.66	5	20hl		46,203.12		II
61.36	—	4		252.58		II
2,142.81	2	20hl		46,642.94		II

TABLE 2.—*Band heads in the spectrum of lanthanum monoxide (La O)*

λ air I. A.	Intensity	ν vac cm⁻¹	System and v′, v″
8,423.3	2	11,868.6	VII 14, 14
8,994.5	3	11,114.9	VII 14, 15
9,035.9	1	11,063.9	VII 15, 16
9,073.4	1	11,018.2	VII 0, 2
9,111.5	2	10,972.1	VII 1, 3
9,150.1	2	925.9	VII 2, 4
9,188.8	4	879.8	VII 3, 5
9,228.15	4	833.4	VII 4, 6
9,267.8	4	787.1	VII 5, 7
9,307.8	4	740.7	VII 6, 8
9,348.2	3	694.3	VII 7, 9
9,388.8	3	648.1	VII 8, 10
9,429.9	3	601.7	VII 9, 11
9,471.4	3	555.2	VII 10, 12
9,513.3	3	508.7	VII 11, 13
9,555.5	3	462.3	VII 12, 14
9,582.2	3	415.8	VII 13, 15
9,641.1	3	369.4	VII 14, 16
9,684.8	3	322.6	VII 15, 17
9,729.1	3	10,275.6	VII 16, 18

WASHINGTON, June 11, 1932.